High CO_x Hydrogenation to Methane over $Co_aCe_{1-a}O_x$ at Low Temperature Prepared by Co-precipitation Method

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Conversion of CO_2 to methane,which is a versatile feedstock,is one of the most effective solution to solve the global warming problem by increasing CO_2 concentration. Noble metal-based catalysts are believed to be more active in CO_z methanation,however, those catalysts are limited in industrial applications due to their higher volatility, higher cost than other catalysts as well as easy sintering at relatively high temperature. Therefore, CO_z methanation via heterogeneous catalysts has recently attracted a considerable amount of attention.

Cobalt-Ceria catalysts, $Co_aCe_{1-a}O_x$, with various Co^{2+}/Ce^{4+} molar ratios from 3:7 to 9:1 were prepared by co-precipitation method and calcined at 500°C for 5 h in the air stream, then were subsequently characterized by means of X-ray diffraction (XRD), N_2 physisorption and desorption and H_2-Temperature programmed reduction (H_2-TPR). The effects of CeO_2 content on catalytic performance were evaluated in the separated CO and CO_2 methanation reaction in the fixed-bed reactor by the excess of H_2 at the temperature range of 120°C-350°C. The calcination temperature effects were also investigated at 350°C and 500°C of Co_3O_4 and $Co_{0.9}Ce_{0.1}O_x$ catalysts.